

# SARS Surveillance in the United States:

## Past Lessons and Preparing for the Future

Chris Van Beneden, MD, MPH  
Respiratory Diseases Branch  
National Centers for Infectious Diseases  
Centers for Disease Control and Prevention



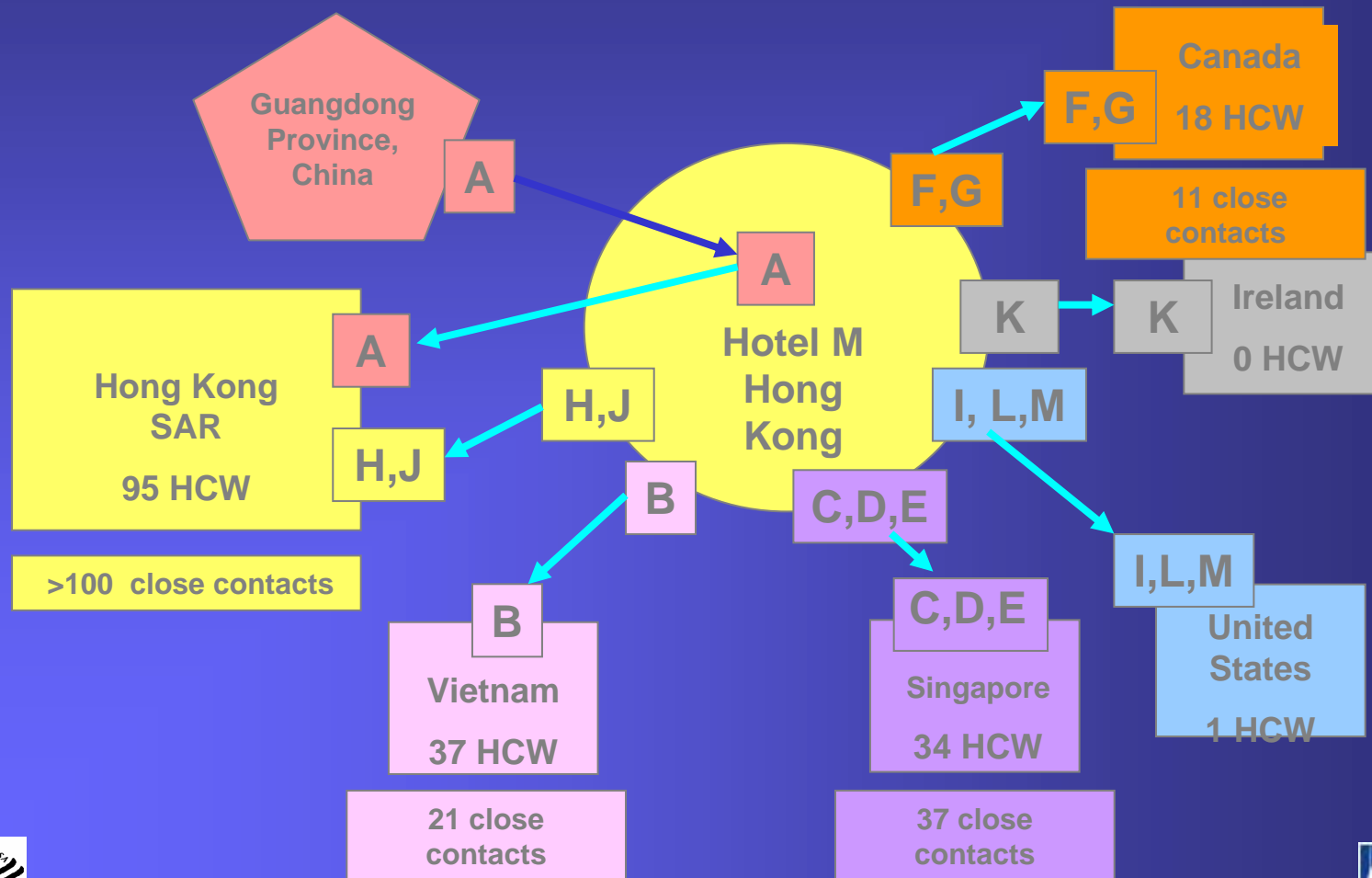
# Outline

- Epidemiology of SARS: lessons learned
- Surveillance objectives and strategies
- Preparing for SARS surveillance in absence of known activity worldwide
- Surveillance in presence of SARS activity
- Contact tracing
- Key surveillance messages

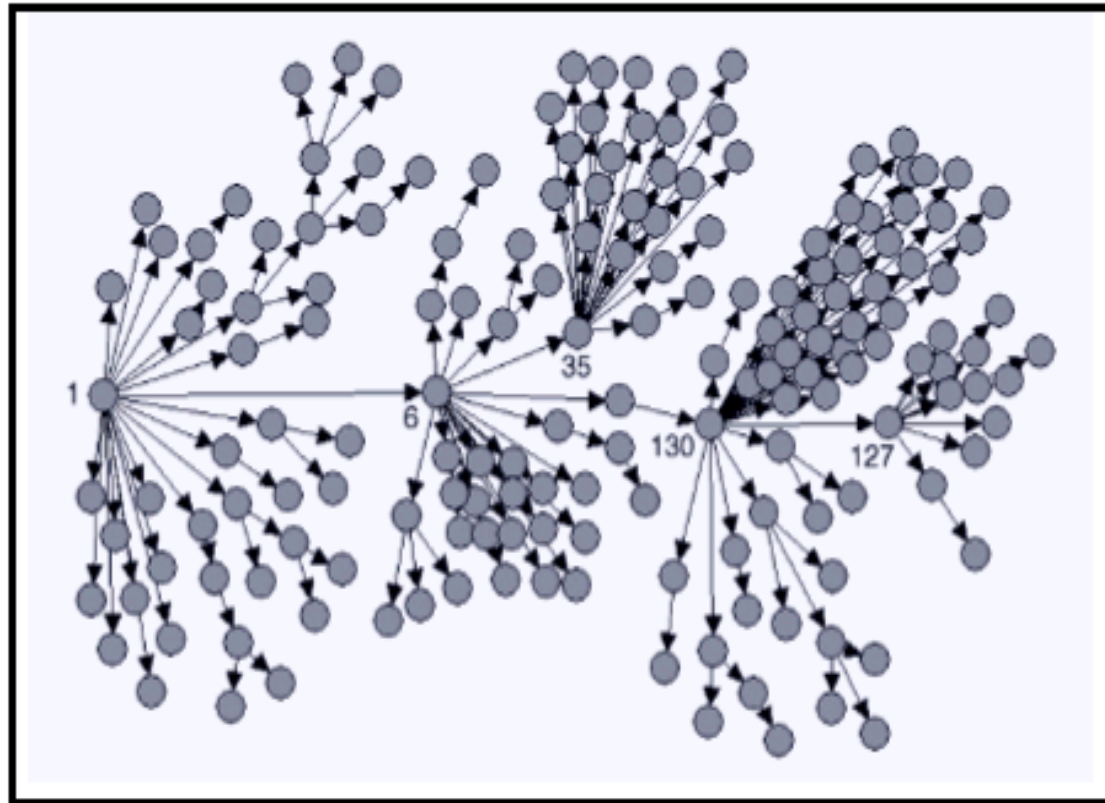


# Effect of Travel and Missed Cases on the SARS Epidemic

## Spread from Hotel M, Hong Kong

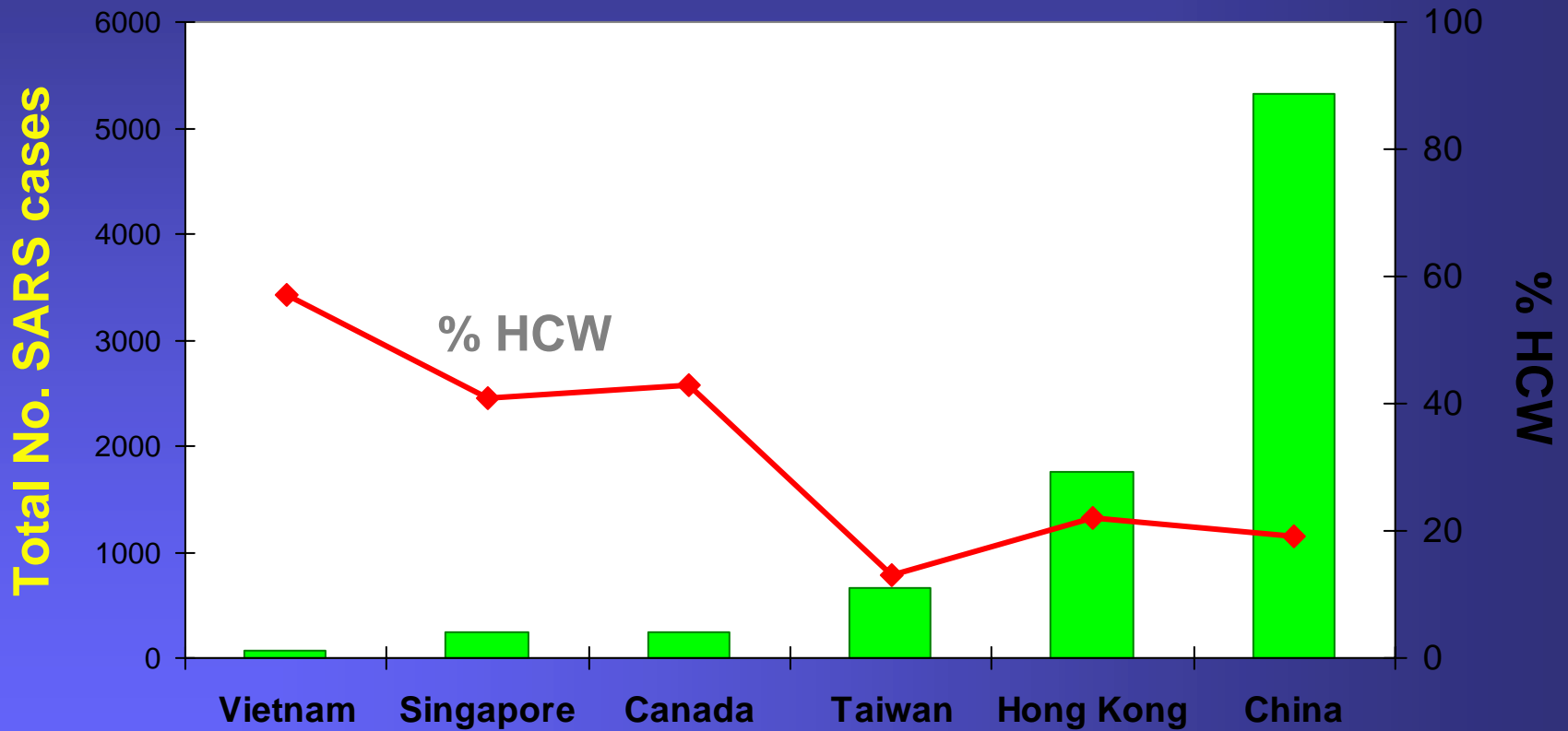


# Person to Person Spread



**Probable cases of SARS by reported source of infection,  
Singapore, Feb 25 – Apr 30**

# Total SARS Cases and % Healthcare Workers by Location



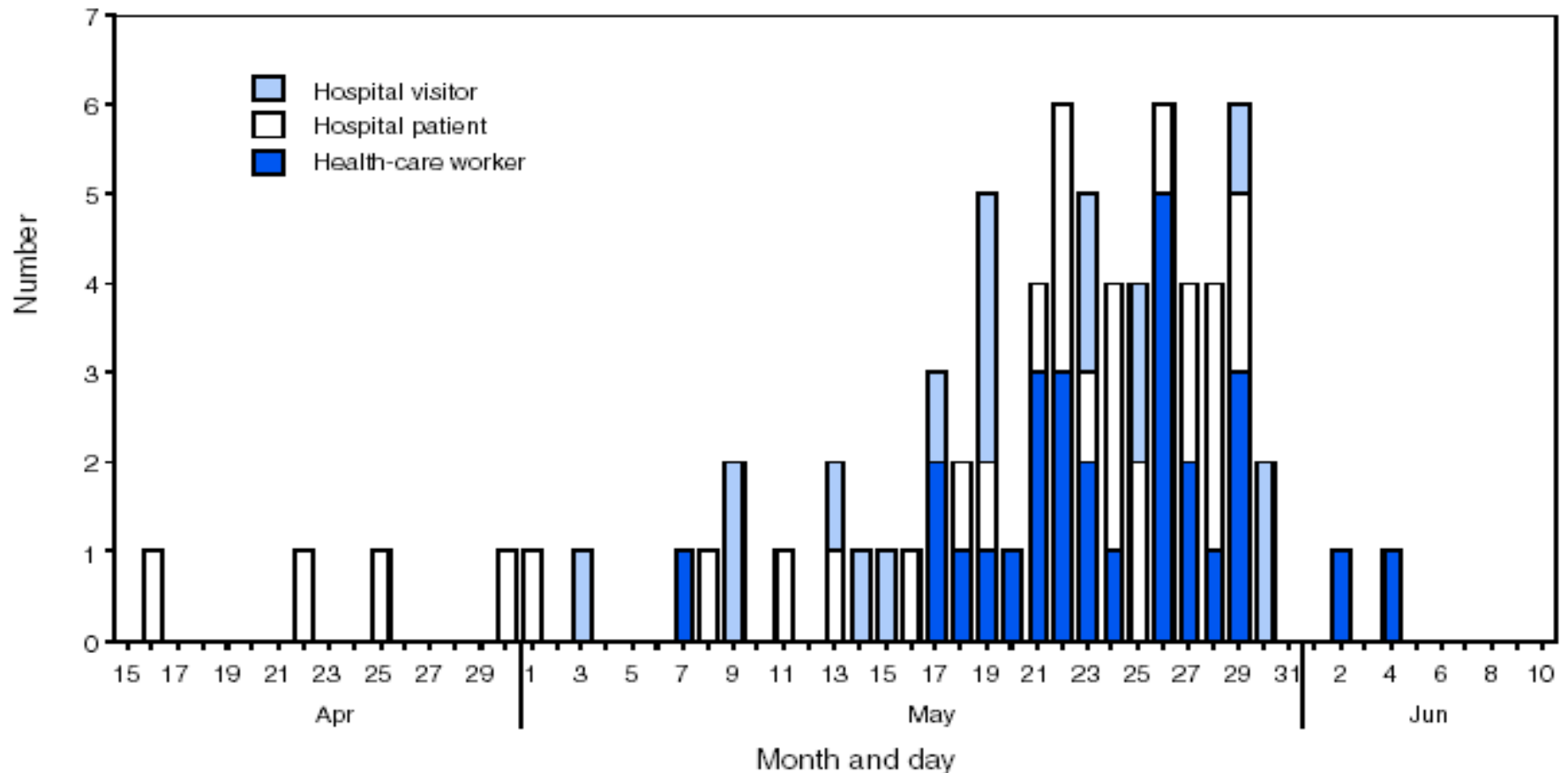
# Other High-risk Populations: Patients and Visitors

- **Greater Toronto Area**
  - 375 total SARS cases (suspect and probable)
    - 107 (28%) patients or visitors
- **Taiwan**
  - 668 probable SARS cases
    - 256 (38%) patients or visitors



# Second Wave of SARS Outbreak in Toronto

FIGURE 2. Number\* of reported cases of severe acute respiratory syndrome, by source of infection and date of illness onset — Toronto, Canada, April 15–June 9, 2003



\* N = 74.

# U.S. SARS cases, 2003

Type of Case	No.	CoV+*	CoV-	Pending
Probable	74	8	38	28
Suspect	344	0	169	175

\*Based on SARS antibody + or – at  $\geq 28$  days



# Worldwide Outbreak: Key Epidemiologic Features

- Global travel aided spread of SARS
- Healthcare facilities played central role
- Most cases were spread person-to-person
- Vast majority of febrile respiratory infections in U.S. were not SARS



# Outline

- Epidemiology of SARS: lessons learned
- Surveillance objectives and strategies
- Preparing for SARS surveillance in absence of known activity worldwide
- Surveillance in presence of SARS activity
- Contact tracing
- Key surveillance messages

# Surveillance: Foundation of SARS Preparedness Plans

- First line of response preparations for potential re-emergence of SARS
- Key components:
  - Identification of cases
  - Identification, evaluation and monitoring of contacts for potential spread of disease
  - Timely reporting and tracking of cases
  - Dissemination of updated information to assist in detection and containment of disease
  - Real-time data analysis



# SARS Surveillance: Objectives

- Early detection of SARS-CoV cases with or without recognized re-emergence overseas
- Rapid institution of control measures to limit disease spread
  - Isolation and infection control
  - Contact tracing



# Surveillance Preparedness: Key Concepts

- Missed cases can lead to many additional cases
- Early case diagnosis and detection can prevent further transmission
- Potential for global spread requires collaboration and communication between healthcare and public health communities
- SARS activity is typically facility- and community-specific



# Surveillance Challenges

- Non-specific clinical presentation
- Difficult to distinguish from other respiratory diseases
- No rapid diagnostic test that can reliably detect infection early in the illness



# Surveillance Opportunities

- Nearly all laboratory-confirmed cases have X-ray evidence of pneumonia by day 7
- History of risk of exposure to SARS is usually present
- Transmission most often occurs during close contact exposures in healthcare settings or households



# Surveillance Strategies: Levels of SARS Activity

- Level of SARS transmission in the community determines risks of exposure
  - Absence of known SARS activity worldwide
  - Presence of known SARS activity



**“SARS activity anywhere has global impact”**



# Strategies Surveillance: Impact of level of SARS Activity

- Core surveillance (zero or low-level activity)
  - Based on “classic” clinical SARS presentation
  - Passive surveillance of high risk exposures
  - Rapid reporting and information dissemination
- Enhanced or accelerated surveillance
  - Screen broader range of clinical presentations
  - Active surveillance of persons in high-risk settings (i.e., hospitals, transportation centers)



# Outline

- Epidemiology of SARS: lessons learned
- Surveillance objectives and strategies
- Preparing for SARS surveillance in absence of known activity worldwide
  - Healthcare provider
  - State and local public health
- Surveillance in presence of SARS activity
- Contact tracing
- Key surveillance messages



# Will SARS Re-emerge?

- Potential sources of re-emergence
  - Animal reservoir
  - Humans with persistent infection
  - Unrecognized transmission in humans
  - Laboratory exposure
- SARS most likely to recur outside U.S.
  - Well-established global surveillance is key to recognition of first case

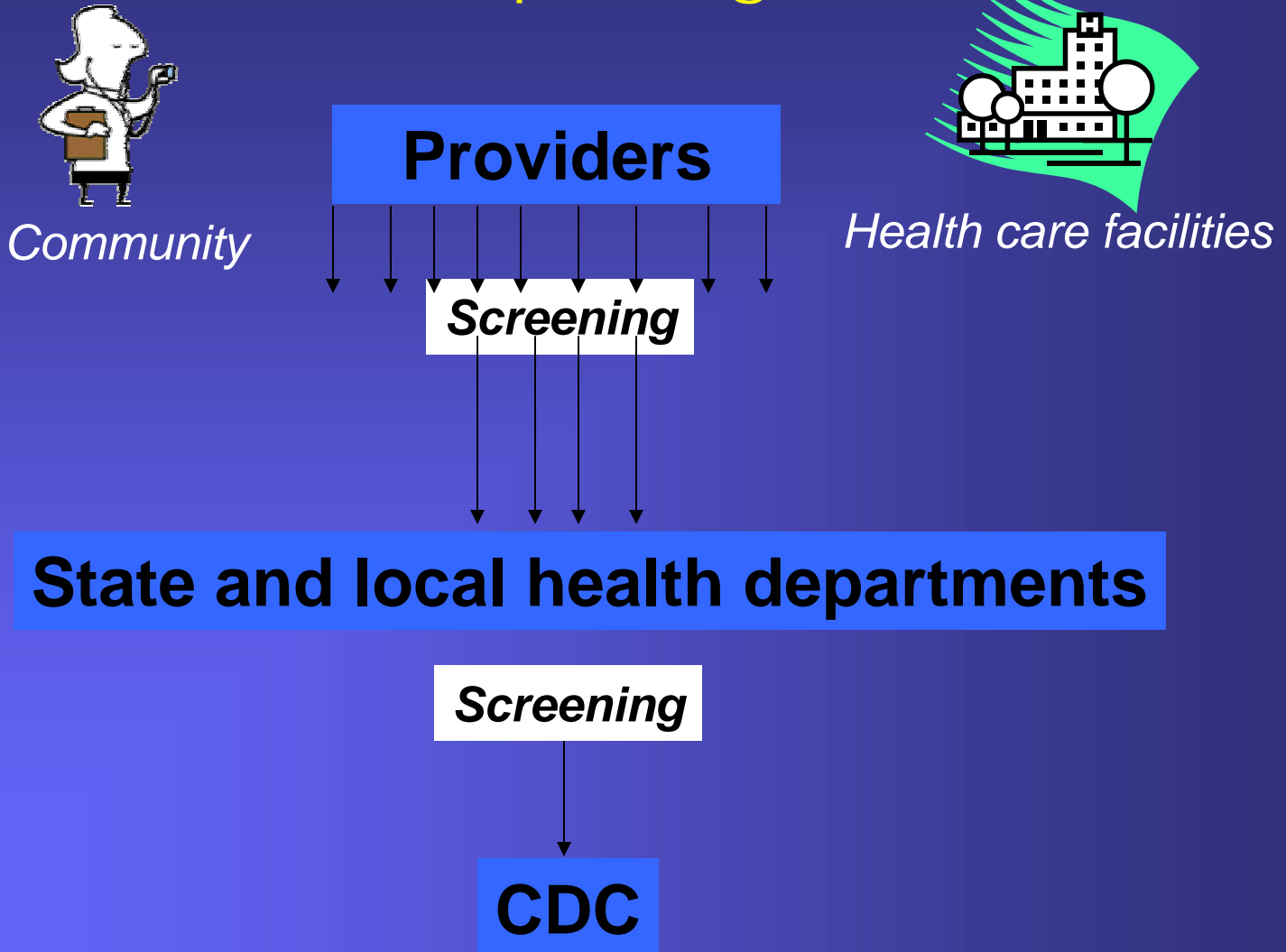


# SARS Surveillance in the Setting of No Known Activity Worldwide

- No epidemiologic links
- Screen for characteristics associated with persons at increased risk for SARS
  - Severe disease: pneumonia requiring hospitalization
  - Potential exposure to unrecognized SARS cases
    - Travelers
    - Healthcare workers
    - Clusters of unexplained pneumonia



# Approach to Surveillance and Reporting



# Astute Clinicians are 1<sup>st</sup> Line of Response

## Screen all persons hospitalized for CXR-confirmed pneumonia:



1. “Have you **traveled** outside the U.S. in the last 10 days? If so, where did you travel?

Do you have any close contacts who became ill after traveling outside the U.S.? If so, where did they travel?”



2. “Are you employed as a **healthcare worker** with direct patient contact?”



3. “Do you have **close contacts** who have been told they have pneumonia?”

# If Patient Hospitalized for Pneumonia Answers "Yes" to at Least One Question\*:

## Providers:

- Notify state or local health department
- Consider SARS testing if no alternative diagnosis found in 72 hours

**\*If travel question reveal that the patient or ill contact  
traveled to a previously affected SARS area**



# If Patient Hospitalized for Pneumonia Answers "Yes" to at Least One Question\*:

## Providers:

- Notify state or local health department
- Consider SARS testing if no alternative diagnosis found in 72 hours

**Testing for SARS-CoV should only be done in  
consultation with public health partners**

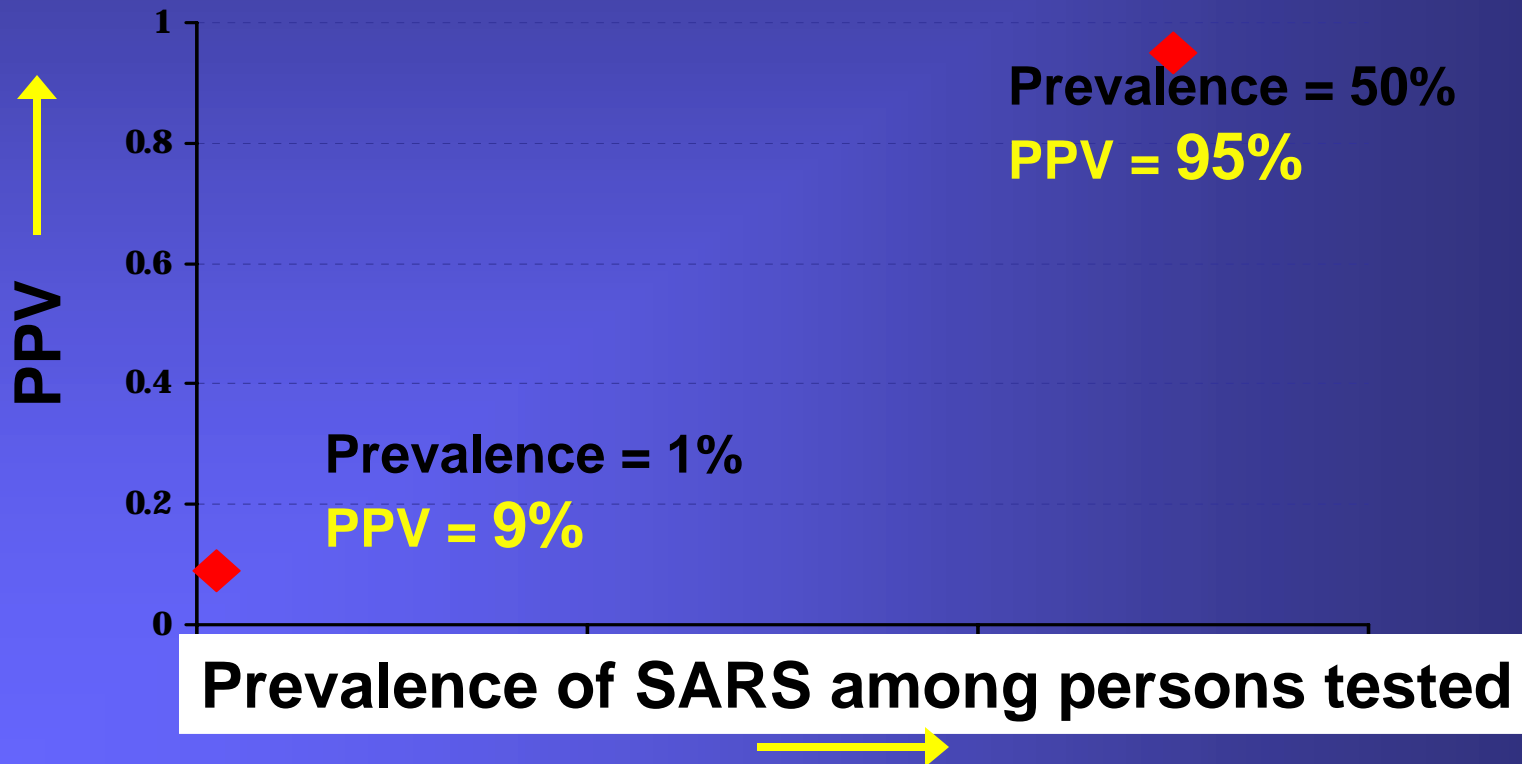
**\*If travel question reveal that the patient or ill contact  
traveled to a previously affected SARS area**





# Effect of disease Prevalence on Positive Predictive Value (PPV)

Sensitivity of detecting SARS in clinical specimen = 50%  
Specificity of test = 95%

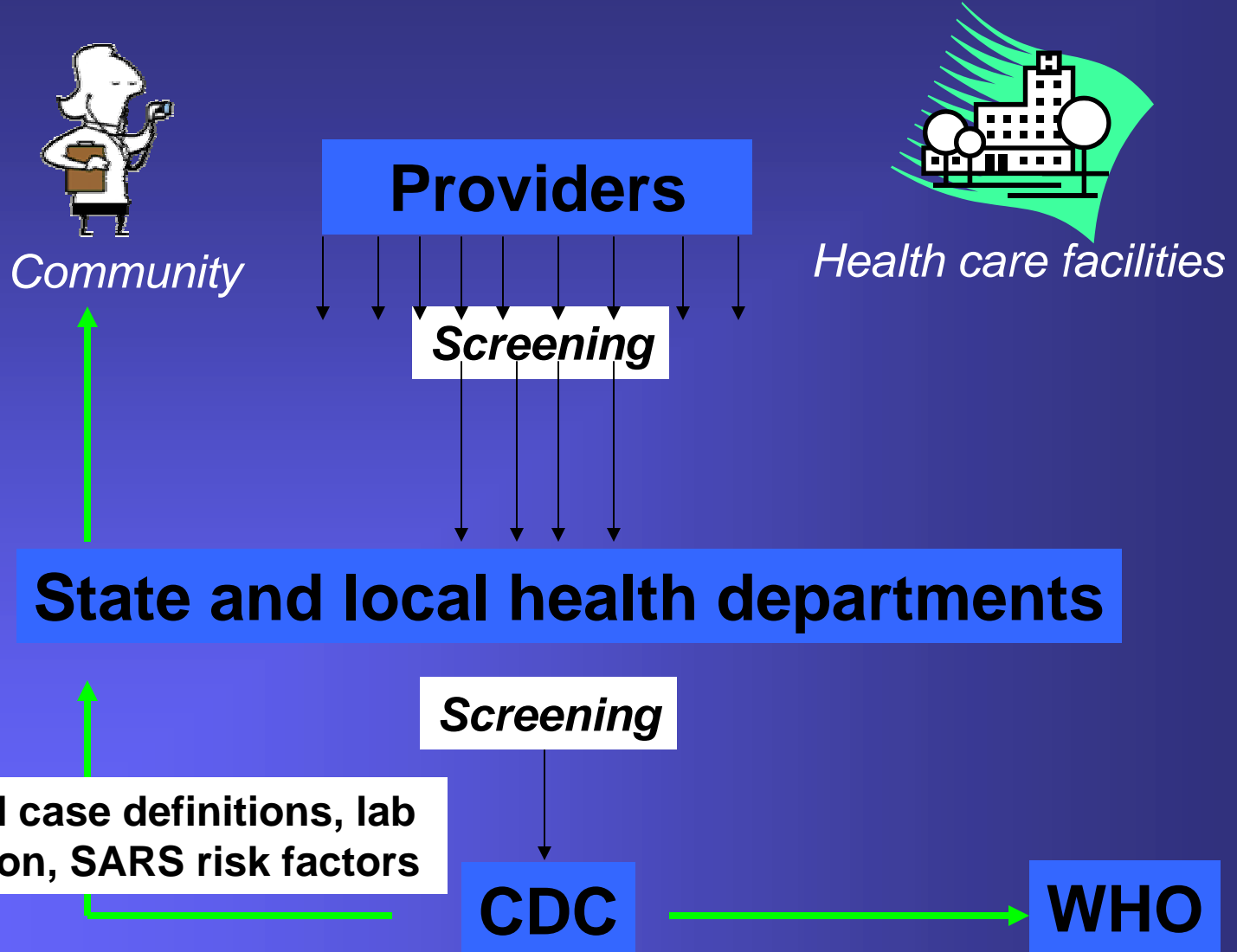


# State and Local Public Health

- Work with providers to determine if SARS-CoV testing is appropriate
- Review individual reports from providers to further assess likelihood of SARS
  - Detect pneumonia clusters
  - Identify cases raising further index of suspicion for SARS
    - Travelers exposed to person with pneumonia or a healthcare facility
    - Healthcare workers with direct patient contact who are part of unexplained pneumonia cluster



# Approach to Surveillance and Reporting



# Outline

- Epidemiology of SARS: lessons learned
- Surveillance objectives and strategies
- Preparing for SARS surveillance in absence of known activity worldwide
- Surveillance in presence of SARS activity
- Contact tracing
- Key surveillance messages



# Surveillance Strategies in Presence of SARS Activity

Probability that respiratory illness is SARS increases

Keep up-to-date on global and local transmission

Consider SARS in patients with early or mild respiratory illness who have specific SARS risk factors:



## Presence of SARS activity: Role of provider

- Continue to screen persons hospitalized for pneumonia
- Screen patients with fever *or* respiratory symptoms for **SARS risk factors** in 10 days prior onset:
  - Travel to foreign or domestic location with recent local SARS transmission
  - Close contact with a person who has known or suspected SARS infection
- Report all persons suspected to have SARS-CoV infection to public health officials



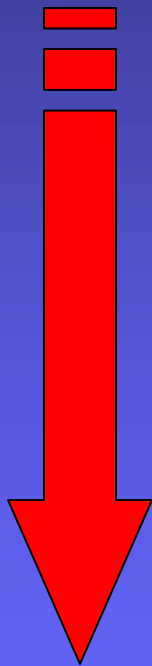
# Hospital-based SARS surveillance

- Level of response activities should be adapted to the local situation
- Triggers for accelerated surveillance:
  - Significant increase numbers of cases
  - Documented or suspected unlinked transmission
  - Changing transmission patterns



# Hospital-based SARS surveillance Options for Enhanced Surveillance

Facility with no  
SARS cases



Facility with unlinked  
nosocomial  
transmission

Be alert for clusters of pneumonia among HCWs

Monitor HCWs taking care of SARS patients  
daily for fever, cough or shortness of  
breath

Screen all visitors

Monitor daily:

healthcare workers

inpatients

**Fever, cough, or  
shortness of breath?**

**SARS risk factors?**





# Role of State and Local Public Health

- Disseminate updated information and guidelines to providers
- Review potential cases reported by providers and evaluate for SARS testing
- Identify and evaluate clusters of unexplained pneumonia
- Report SARS-CoV + cases to CDC immediately
- Conduct contact tracing



# Reporting SARS Cases

- SARS activity anywhere in the world has global implications
- Reporting is critical



# Outline

- Epidemiology of SARS: lessons learned
- Surveillance objectives and strategies
- Preparing for SARS surveillance in absence of known activity worldwide
- Surveillance in presence of SARS activity
- Contact tracing
- Key surveillance messages



# Goals of Contact Tracing

- Promptly identify, evaluate and monitor close contacts of SARS cases
- Prevent spread from contacts by monitoring for evidence of infection and the need for isolation
- Critical to disease containment



# Contact Tracing

**Rapid** identification and evaluation of all close contacts of SARS cases is **critical** to stopping disease transmission



# SARS Surveillance Preparedness: Key Messages

- Early case detection is critical to prevent disease spread
- Risk of exposure to SARS is key to considering likelihood of diagnosis
- Rapid contact tracing is essential to disease containment
- SARS response should be adjusted to the extent of disease in local community or facility
- Collaboration between health care providers and public health agencies is critical to SARS preparedness



# SARS Surveillance Plans

- SARS preparedness plans are in progress
- Finalized documents will be distributed via external partners and CDC website:

<http://www.cdc.gov/ncidod/sars/>



# Acknowledgements

- CDC SARS Preparedness Task Force members
- Representatives from CSTE, ASTHO, NACCHO, APHL, ASM, AHA, NPHIC, HICPAC, APIC, SHEA, IDSA, NIH and other professional organizations

